FATTENING RANGE LAMBS.

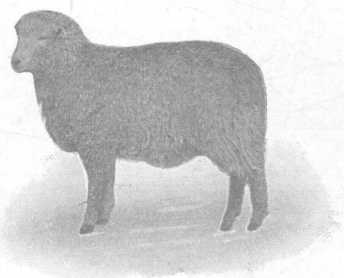
A COMPARISON OF RATIONS.

OHIO

Agricultural Experiment Station.

WOOSTER, OHIO, U. S. A. DECEMBER, 1906.

BULLETIN 179.



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Mr. S. J. Fryer rendered valuable aid in planning this experiment and exercised great care in executing its details. The Cleveland Provision Company kindly furnished figures relating to the dressed percentages yielded by the different lots. To both of the above, the author is glad to express his appreciation of their assistance.

BULLETIN
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NUMBER 179. DECEMBER, 1906.

FATTENING RANGE LAMBS.

A COMPARISON OF RATIONS.

BY B. E. CARMICHAEL.

On account of the importance of the sheep feeding industry in Ohio and the need for accurate information concerning rations and management, the Animal Husbandry department of this Station has begun a series of experiments in fattening sheep. The experiment which is considered in this bulletin was conducted during the winter of 1905–'06 by Mr. S. J. Fryer at his farm in Wayne county, in co-operation with the Animal Husbandry department of the Station.

OBJECT.

The object of the experiment was to test the advisability of feeding to fattening range lambs, cottonseed meal, linseed oil meal, or Dr. Hess' stock food with corn, alfalfa and clover.

LAMBS USED IN THE EXPERIMENT.

The lambs used in this experiment, 160 head, fed in four lots of forty each, were all wethers, selected from a flock of 658 head which Mr Fryer had purchased for his winter feeding. The lambs were selected with a view to securing uniformity of lots and uniformity of the lambs within each lot. There was an excellent opportunity for such a selection, and none of the lots possessed an apparent advantage over any other lot so far as ability to make gains was concerned.

The lambs were raised in Wyoming and were said to be from quarter-blood Cotswold ewes and three-quarter-blood rams of the same breed. They resembled the Cotswold type more than the Merino, although they probably descended from a foundation stock rich in Merino blood. They were purchased on the Chicago market by a commission firm upon order for Mr. Fryer on September 18, 1905. On September 19 they were shipped from Chicago and arrived at Mr. Fryer's farm on the following day.

The entire flock was allowed to graze on clover and bluegrass—chiefly bluegrass—without grain until October 24. Beginning October 24 they were put in the feeding barn each night and given about one-half bushel of shelled corn per day for the flock of 658 head. The allowance of grain was gradually increased until they received 140 pounds of corn on November 7, when they were first confined to the barn for the entire day. On November 14, 210 pounds of grain was being fed to the entire lot. Lots 2, 3, and 4, which were to receive cottonseed meal, linseed oil meal, and stock food respectively, were given small allowances of these materials before the experiment began. November 30, when the experiment began, each lot of 40 lambs received 30 pounds of total concentrates. A liberal supply of mixed hay was fed from the time the lambs were first put into the barn.

RATIONS.

The four lots of lambs received grain rations as follows:

Lot 1, corn.
Lot 2, corn and cottonseed meal.
Lot 3, corn and linseed oil meal.
Lot 4, corn and Dr. Hess' stock food.

The amount of corn, cottonseed meal, linseed oil meal and Dr. Hess' stock food fed to the various lots during different parts of the test, are given in Table 1.

TABLE 1.

	Lot 1	Lot 2		Lot 3		Lot 4	
Date	Corn lbs.	Corn lbs.	Cotton seed meal lbs.	Corn lbs.	Linseed oil meal lbs.	Corn lbs.	Stock food table spoon-fuls
Nov. 30.....	30	26	4	26	4	30	8
Dec. 1-7.....	36	30	6	30	6	35.5	8
Dec. 8.	36	30	6	30	6	35 5	16
Dec. 9-15.....	36	30	6	30	6	36	16
Dec. 16, Jan. 6	42	35	7	35	7	42	16
Jan. 7-12.....	44	37	7	37	7	44	16
Jan. 13-18.....	46	39	7	39	7	46	16
Jan. 19-25.....	48	40	8	40	8	48	16
Jan. 26, Feb. 24	54	45	9	45	9	54	16
Feb. 25, Mar. 1	60	50	10	50	10	60	16
Mar. 2-12	60	50	10	50	10	58.5	16

The plan was to feed five pounds of corn to one of cottonseed meal and of linseed oil meal to lots 2 and 3 respectively as soon as they became accustomed to the feeds, but owing to a tendency to scouring, thought to be be due to these feeds, a slight reduction of cottonseed meal and linseed oil meal as shown in the table was made from January 7 to 18 inclusive. Dr. Hess' stock food was fed according to directions. For a few days at first an amount of corn equal in weight to the amount of stock food given was deducted from the regular allowance of grain, so that each lot received the same number of pounds of feed. Owing to the small weight involved and to the inconvenience of making this deduction it was later decided to feed the same amount of corn to lot 4 as to lot 1, with stock food in addition. Aside from this slight difference each lot received at all times during the experiment the same weight of concentrates, as well as of hay, daily per lamb.

The corn used was of good quality and was fed in the form of shelled corn. Upon analysis it showed a larger percentage (23.38 percent) of moisture than is commonly found, due to the fact that the sample was taken early in the winter before the corn had become thoroughly dry. Cottonseed meal was purchased from a Memphis, Tennessee, firm and was the finely ground meal. The linseed oil meal was purchased from a Mansfield, Ohio firm; it was in the form commonly known as "pea size". The Dr. Hess' stock food was purchased from a local dealer. Aside from showing a slight dislike for the cottonseed meal for a while at first, the lambs ate all of the feeds very readily.

As noted above, lots 2 and 3 seemed to show a tendency to scour for a while; lot 4 showed a marked tendency in this direction for a short time after the stock food was first given, but later became normal in this respect.

Although different kinds of roughage were fed during the test, for the sake of variety, all lots received the same kind and amount within a given period. The kinds of roughage used and periods within which each was used are given in Table 2. Except for two days, when a trial of one and three-fourth pounds per lamb was made, each lot received one and one-half pounds of hay per lamb daily.

TABLE 2.

Date	Kind of Hay
Nov. 30–Dec. 7, a. m.	Clover.
Dec. 7, p. m.–Dec. 9, a. m.	Alfalfa and bluegrass.
Dec. 9, p. m.–Dec. 11.	Clover.
Dec. 12–Dec. 17.	Alfalfa and bluegrass.
Dec. 18–Dec. 29.	Clover.
Dec. 30–Jan. 11.	Clover and bluegrass.
Jan. 12–Mar. 10.	Alfalfa and bluegrass.
Mar. 11–Mar. 12.	Clover.

FEEDING.

Each day's ration was fed in two equal portions; grain was fed at 7 a. m. and 4 p. m., followed by hay in each instance. The lambs soon became accustomed to this regularity and during the interval between the time when the morning feed had been eaten and the time for feeding in the afternoon, were usually very quiet.

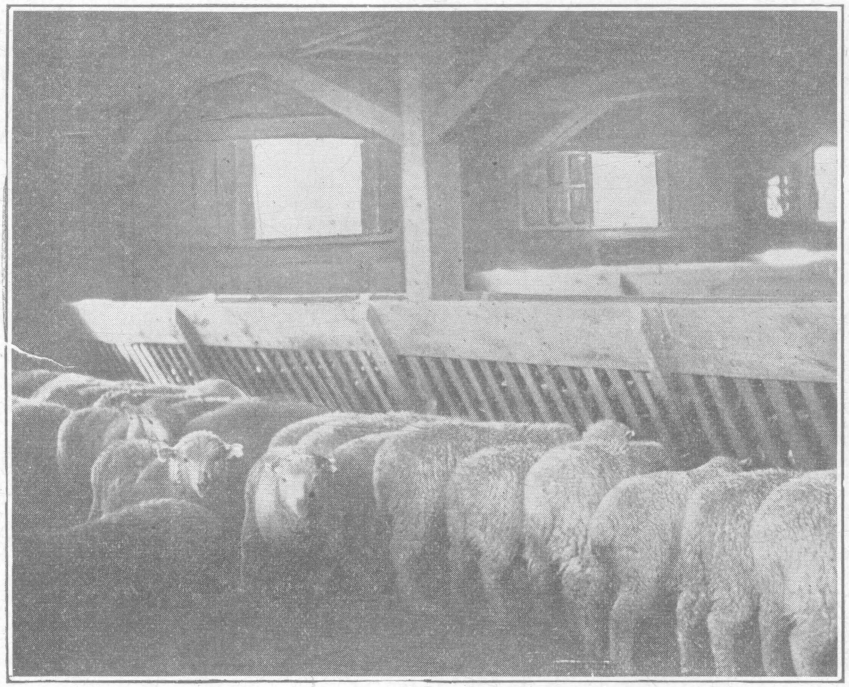

PLATE II—Arrangement of racks, and means of lighting and ventilating. (West side of barn)

BEDDING.

Bedding was supplied in sufficient quantities to keep the pens in good condition. The straw used for this purpose was for the greater part oat straw, although a small amount of wheat straw was used. Each pen was supplied with straw for bedding about once every five days, the average daily amount used for each pen being 7.23 pounds. The rejected portion of the roughage was used for bedding, being returned, after weighing, to the lot which refused it. The roughage so rejected and used was for the most part not suitable for food, being made up largely of grain stubble and the rougher portions of the stems of the hay plants.

SALT.

A mixture of salt, 4 parts, and sulphur, 1 part, was supplied to the lambs, one and one-fourth pounds being given to each lot of 40 head twice weekly.

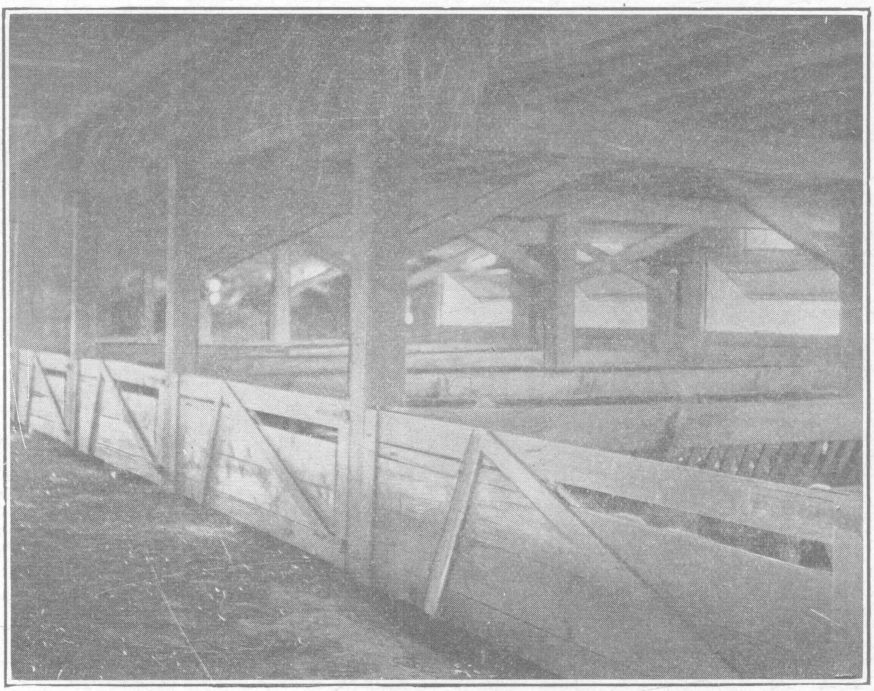

PLATE III—Arrangement of pens and means of lighting and ventilating. (East side of barn)

QUARTERS.

The lambs were fed in a barn 64 by 100 feet (see Plate I) with hay storage above. A row of 8 pens 12.5 feet wide by 26 feet long (these measurements include the space occupied by feed racks and watering tanks) was on each side of the barn, with a 12-foot driveway between the rows of pens. Racks for hay and grain extended along each side of each pen, giving about 50 feet of feeding space for each 40 lambs; water was supplied in automatically regulated tanks, one located at the end of each alternate feeding rack, so that one tank furnished water for two lots. The racks and tanks thus arranged formed the partitions between the different pens. Vertical partitions, not shown in the cuts, divided the racks for the lots under experiment. Plates II and III show the interior arrangement of the barn and provisions for light and ventilation. Beside the doors and windows shown in the cuts there were large doors at each end of the driveway and a large opening at the center of the barn, into the haymow, from which four small ventilators, two on each side of the roof, opened. (See Plate I).

The pens occupied by the four lots used in this experiment were the north four pens east of the alley. Lot 1 was farthest north, the lots being numbered consecutively towards the south.

Throughout the experiment the lambs were taken from the pens once each week to be weighed, but aside from this were seldom out of the pens, which afforded only a trifle over 7 square feet per lamb. Although these range lambs had previously been accustomed to an abundance of outdoor exercise, they seemed to suffer no inconvenience from the close confinement.

TABLE 3—WEEKLY, INITIAL, AND FINAL WEIGHTS, AND WEEKLY GAINS.

Date	Time	Lot 1		Lot 2		Lot 3		Lot 4	
		Weight	Gain	Weight	Gain	Weight	Gain	Weight	Gain
Nov. 29	7:40 am	2700		2690		2690		2685	
" 30	"	2720		2670		2710		2700	
Dec. 1	"	2680		2630		2665		2655	
Av. 1st 3 wts.*		**2700**		**2663.3**		**2688.3**		**2680**	
Dec. 7	3:30 pm	2730	30	2700	36.7	2700	11.7	2705	25
" 14	"	2765	35	2750	50	2760	60	2730	25
" 21	"	2845	80	2800	50	2830	70	2815	85
" 28	"	2890	45	2900	100	2905	75	2880	65
Jan. 4	"	2970	80	2980	80	2970	65	2940	60
" 11	"	3025	55	3030	50	3060	90	3035	95
" 18	"	3115	90	3115	85	3130	70	3120	85
" 25	"	3175	60	3180	65	3195	65	3205	85
Feb. 1	"	3380	205	3350	170	3355	160	3370	165
" 8	"	3470	90	3460	110	3485	130	3515	145
" 15	"	3650	180	3645	185	3650	165	3665	150
" 22	"	3690	40	3690	45	3685	35	3710	45
Mar. 1	"	3825	135	3830	140	3840	155	†3795	†85
" 8	"	3870	45	3870	40	3870	30	3810	15
Av. last 3 wts.‡		**3930**		**3940**		**3935**		**3881.7**	
Mar. 12	7 am	3920		3930		3910		3860	
" 13	"	3930		3940		3945		3890	
" 14	"	3940		3950		3950		3895	

*Average of weights taken Nov. 29, 30 and Dec. 1, is considered the initial weight Nov. 30.
†One lamb died the morning of Mar. 1, weight 85 lbs. after dead.
‡Average of weights taken Mar. 12, 13 and 14 is considered the final weight Mar. 13.

LIVE WEIGHTS AND GAINS.

Both at the beginning and close of the experiment, each lot was weighed three consecutive mornings before being fed or watered, water having been shut off at 5 p. m. the day previous. The average of each three weights thus obtained was considered the weight on the second day, and these averages were taken as the initial and the final weights respectively.

A study of Table 3 will bring to notice the variation in weight of animals from day to day and the great fluctuations in apparent gains made in the intervals between weighing. The gains made by all the lots from January 25 to February 15 were very large, followed by a week of very small gains, with large gains the subsequent week. The reasons for these variations and fluctuations are not easily determined, since so many factors might be concerned. All weekly weights were taken under as nearly identical conditions as could be secured by regularity of feeding and the withholding of water from 10 a. m. until after weighing at 3:30 p. m. each day, so that the possibility of variations, due to food or water consumed, was reduced to the minimum. In spite of these precautions, however, the variations were very marked in some instances, even on consecutive days.

TABLE 4—SUMMARY OF WEIGHTS AND GAINS.

Lot	Grain rations	*Initial weight	†Final weight	Total gain	Daily gain per lamb
1	Corn.	2700	3930	1230	.298
2	Corn, cottonseed meal.....	2663.3	3940	1276.7	.309
3	Corn, linseed oil meal.....	2588.3	3935	1246.7	.302
4	Corn, Mr. Hess' stock food.....	2680	‡3881.7	1286.7	.312

*Average of three weights, Nov. 29, 30, Dec. 1. †Average of three weights, March 12, 13, 14. ‡One lamb died March 1, weight 85 lbs.

The total gains and daily gains per lamb for each lot are shown in Table 4. As will be observed, lots 2, 3 and 4 made somewhat larger gains than did lot 1. The differences in favor of lots 2, 3 and 4 are so small, however, that it cannot be said that any of the rations possessed a decided superiority over any other so far as ability to produce gains was concerned. It would not be surprising if the same rations should give opposite results in future trials, and it is safe for us to consider that the rations tested are of practically equal value pound per pound for use in lamb feeding under the conditions of this test. Although the gains made may be considered the same for all practical purposes, yet the gains actually obtained in this test will be used as the basis of all comparisons and discussions in this bulletin.

TABLE 5—FOOD CONSUMED, GAINS PRODUCED, AND COST OF GAINS.

Kind of feed	Price	Lot 1		Lot 2		Lot 3		Lot 4	
		Amount	Value	Amount	Value	Amount	Value	Amount	Value
Corn	48c. per bu.	88.39 bu.	$ 42.43	73.78 bu.	$ 35.42	73.78 bu.	$ 35.42	88.02 bu.	$ 42.25
Cottonseed meal	$30 per ton			.409 ton	12.27				
Linseed oil meal	$31.20 per ton					.409 ton	12.76		
Dr. Hess' st'k food	5c. per lb.							32 lbs.	1.60
*Clover hay	$5.50 per ton	1.12 ton	6.16	1.12 ton	6.16	1.12 ton	6.16	1.118 ton	6.15
*Alfalfa hay	$6 per ton	1.98 ton	11.88	1.98 ton	11.88	1 98 ton	11.88	1.973 ton	11.84
Total value of feed.....			.$60.47		$ 65.73		$ 66.22		$ 61.84
Total gains, pounds			1230		1276.7		1246.7		1286.7
Daily gain per head, pounds			298		.309		.302		.313
Cost per lb. of gain on basis of above prices for feed.....			$.0491		$ .0514		$ .0531		$ .0480

*Part of the hay was mixed with bluegrass.

While the extent of gains was approximately the same for all of the lots, it is worthy of note that the cost of gains is rather widely different for some of the lots. Lot 4, fed a grain ration of corn and stock food, made slightly cheaper gains than did lot 1, fed a grain ration of corn alone, while the gains made by the lots which received cottonseed meal and linseed oil meal were decidedly more expensive than the gains made by lot 1. The cost of gains, however, depends somewhat upon existing market values of the feeds used, so the cost of gains as given in Table 5 must be understood to apply only to the experiment under discussion. Both cottonseed meal and linseed oilmeal are usually more expensive, pound for pound, than corn, and, since they do not appear to increase gains very markedly, it seems doubtful whether it is good business to feed them to fattening lambs in connection with corn, clover and alfalfa.

One lamb in lot 4 was found dead on the morning of March 1. Its weight was obtained and added to the final weight of the lot, so its death did not interfere materially with the test. A reduction in the amount of corn and hay fed to lot 4 was made after the loss of this lamb, in order that the daily amount of feed per lamb might remain the same throughout the test.

TABLE 6—FEED PER 100 LBS. GAIN.

Lot	Ration	Pounds feed* per 100 pounds gain			
		Roughage	Corn		Total
1	Corn.....	504.06	402.44		906.50
2	Corn, cottonseed meal	485.63	323.65	Cottonseed 64.07	873.35
3	Corn, oil meal.....	497.31	331.43	Oil meal 65.61	894.35
4	Corn, Dr. Hess' stock food.....	480.57	383.11	Stock food 2.48	866.16

*Includes all roughage; see table 9 for amount of roughage refused by the different lots.

SHRINKAGE AND DRESSED PERCENTAGE.

The experiment was ended on March 13 so far as feeds consumed and gains produced were concerned. The lambs were, however, fed in the same manner as usual until March 21, when they were shipped to Cleveland. On the afternoon of March 20 the lambs were weighed by lots, water having been shut off just before the weighing began and while the lambs were yet quiet. The lambs were loaded after having received the morning's feed on March 21. Immediately after being unloaded in Cleveland the lambs were weighed without food or water.

TABLE 7—SHRINKAGE, EXPENSE OF MARKETING, SELLING PRICE AND HOME VALUE.

Lot	Cleveland weight, March 22, pounds	Farm weight, March 21, pounds	Pounds shrinkage per cwt.	Expense of marketing	Selling price per cwt. at Cleveland, March 22	Value of lambs per cwt. at farm March 21
1	3850	4015	4.10	$ 3.40	$ 7.25	$ 6.867
2	3820	4025	5.09	3.38	7.25	6.796
3	3830	4020	4.72	3.39	7.25	6.823
4	3780	3965	4.66	3.34	7.25	6.827

The amount of shrinkage of each of the lots, the expense of marketing, the selling price of each lot and their home values per hundredweight are shown in Table 7. It will be observed that lot 1, fed a grain ration of corn only, shrank less in shipment than did any of the other lots, with lots 4, 3 and 2 following in the order named. The home values per hundredweight range, of course, in the same order, since all lots sold for the same price in Cleveland, lot 1 being highest with a value of $6.86 per hundred weight, and lot 2 lowest with a value of $6.796 per hundredweight.

TABLE 8—DRESSED PERCENTAGES.

Lot	Grain ration	Date of slaughter	Live weight at Cleveland	Dressed weight	Dressed percentage
1	Corn.....	March 22	3850	2060	53.5
2	Corn and cottonseed meal.....	" 23	3820	1946	50.9
3	Corn and linseed oil meal.....	" 23	3830	1959	51.1
4	Corn and Dr. Hess' stock food.....	" 22	3780*	1965*	51.9

*39 head.

Table 8, in which the dressed percentages yielded by the various lots are shown, sets forth the significant fact that the dressed percentages range in the same order as do the shrinkages. That is, the lot which shrank the least yielded the highest dressed percentage, while the highest shrinkage and lowest dressed percentage were associated. This indicates that the increased weight of the lambs in lots 2, 3 and 4, was due more largely to growth, instead of to fattening, than was that of lot 1.

The carcasses of the lambs in lots 1 and 4 were considered by experts at the slaughter house heavier in caul-and kidney-fat than were those of lots 2 and 3. In fact, experts pronounced lots 1 and 4 rather too fat to be ideal for the local retail trade. No examination was made of the various cuts of any of the carcasses, owing to the fact that the whole carcasses were sold to retailers. The mere matter of excessive fatness does not affect the lamb feeder's profits so long as this undesirable quality is not in evidence before slaughter, providing, of course, that this excessive fatness has not interfered with economy of gains.

From the results of this test it seems probable that lambs fed as were the lambs in lot 1 would be fat enough for market in a shorter time from the beginning of the fattening period than would lambs fed as were lots 2 and 3. It is not thought that the addition of stock food to the ration would cause any marked difference in this respect, although this test indicates a slight advantage in favor of lot 1.

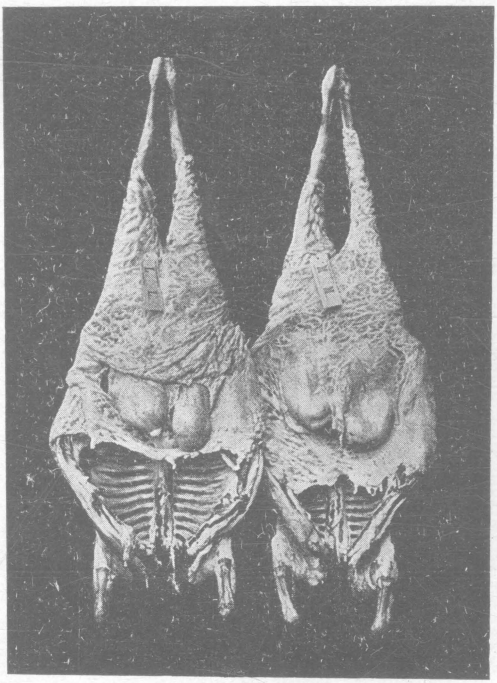

PLATE IV—Representative carcasses.

Plate IV is not intended to show any comparison of carcasses from the different lots but, rather, to show the appearance of average carcasses.

LOSS OF LAMBS.

The number of lambs that died from any cause while on feed was very small. Only one lamb that was under experiment died during the test. Of the entire 658 head purchased in Chicago, the total number that died on the farm from September 20 to April 28 was 6 head—less than 1 percent. Not all of the lambs were fed during the entire period mentioned, however, shipments to market having been made on March 6, March 21, April 21 and April 28. Concerning the loss by death to be expected in feeding range lambs, Mr. J. E. Wing has the following to say:*

"There will be a death loss among feeding lambs no matter how carefully they are fed. Care will greatly reduce this loss. however. The writer has had as low as 2 percent and as high as 8 percent. If no more than 4 percent loss is sustained no one need shed tears".

From the above, the reader will note that the loss by death was much lower during this experiment than usually occurs.

REFUSE ROUGHAGE.

Table 9 shows the amount of roughage refused by the various lots; each lot having received equal amounts per head of roughage of the same kind and quality. In no instance was any large amount of roughage refused, excepting for two days when the daily allowance of hay was increased to 70 pounds per lot. Although the differences are not marked enough to make great variations in total food consumption, nor even to justify any definite conclusions being drawn, yet it is of interest to note that the lots receiving nitrogenous concentrates or Dr. Hess' stock food refused somewhat less of their roughage than did lot 1, fed a grain ration consisting solely of corn. In the light of present evidence it is impossible to say just what bearing the feeding of nitrogenous concentrates may have on the consumption of roughage, although, this, as well as other tests, seems to indicate that the feeding of a nitrogenous concentrate increases, slightly at least, the roughage consumption. Further experimentation is needed along this line.

TABLE 9—ROUGHAGE.

Lot	Grain ration	Roughage fed, lbs.	Roughage refused	
			Lbs.	Percent
1	Corn.....	6200	557.5	8.992
2	Corn, cottonseed meal.....	6200	467.75	7.544
3	Corn, linseed oil meal.....	6200	422.5	6.815
4	Corn, Dr. Hess' stock food.....	6183.5	485.0	7.843

*Pages 258-259 Sheep Farming in America.

MANURE.

The manure was removed from the pens once during the progress of the experiment, and again after the lambs had been shipped to market. The manure from each pen was weighed separately, and samples were taken for analysis before each removal. The samples were analyzed under the direction of J. W. Ames, the Station Chemist, with results as shown in Table 10. The water content of the manure from lot 1 was much lower in both instances than of that from the other lots. It is usually considered that animals which are fed a ration rich in protein will consume more water than will other animals of the same kind fed a low protein ration; this might account for the high water content of manure from lots 2 and 3. The stock food which was fed to lot 4 seemed to contain a considerable amount of common salt, which would doubtless cause the lambs in this lot to drink more water than would lot 1, with the consequent higher water content of manure. The high ash content of the first sample from lot 1 is possibly due to the presence of earth which may have been accidentally removed from the earth floor when the sample was taken.

TABLE 10—AMOUNT AND COMPOSITION OF MANURE PRODUCED BY LAMBS IN 112 DAYS, BEGINNING NOV. 29.

	Lot	Weight of manure, pounds	Composition (percent of fresh substance)					
			Water	Organic matter	Ash	Nitrogen	Phosphoric acid	Potash
Manure	1	5825	55.49	35.81	8.25	1.502	.564	1.276
removed	2	6510	63.31	21.96	4.72	1.507	.554	1.175
January	3	6620	65.23	30.09	4.68	1.458	.504	1.374
24 and 25	4	6195	67.18	28.45	4.37	1.297	.435	1.159
Manure	1	5700	63.90	31.01	5.09	1.480	.477	1.407
removed	2	6415	68 17	27.32	4.51	1.600	.520	1.288
after ex-	3	6550	67.17	28.56	4.27	1.670	.494	1.274
periment	4	6080	68.65	27.32	4.02	1.400	.395	1.189

Table 11 shows the total fertilizing constituents in the manure from each lot, together with their value at the valuations given in the report of the Secretary of the State Board of Agriculture for 1905. Experiments at this Station indicate that a given number of pounds of fertilizing constituents of manure which has been reinforced with phosphorus and has not been exposed to the weather or allowed to heat will produce at least as great an increase of crop as will the

same amounts and combinations of fertilizing elements in the form of the commercial fertilizers mentioned in the note below Table 11. With this the case, the manure produced by fattening lambs is clearly of much more value than many have realized.

TABLE 11—FERTILIZING CONSTITUENTS IN MANURE* AND COMMERCIAL VALUE OF SAME.†

Lot		Nitrogen @ 11.5c	Phosphoric acid @ 3c	Potash @ 5.25c	Total value	Value of manure per ton
1	Pounds	171.85	60.04	154.52		
	Value	$ 19.76	$ 1.80	$ 8.11	$ 29.67	$ 5.15
2	Pounds	200.74	69.42	159.11		
	Value	$ 23.08	$ 2.08	$ 8.35	33.51	5.19
3	Pounds	205.90	65.72	174.40		
	Value	$ 23.67	$ 1.97	$ 9.15	34.79	5.28
4	Pounds	165.46	50.96	144.09		
	Value	$ 19.02	$ 1.52	$ 7.56	28.10	4.58

*See table 10 for amount and percentage composition of manure.
†Official Report of the Secretary of the Ohio State Board of Agriculture on Commercial Fertilizers Licensed, Inspected and Analyzed During the Year 1905. Valuations used for nitrogen and phosphoric acid of manure are those given these fertilizing constituents in tankage; valuation used for potash is as given for potash in muriate of potash.

It will be observed that the tota' . manure from lots 2 and 3 was higher than that of the manure from lots 1 and 4. No reason is apparent for the lower value of the manure from lot 4 as compared with that from lot 1. The difference is so slight, however, that it may safely be considered that the manure from each of the two lots is of equal value.

TABLE 12—COST OF FEED CONSUMED, BEDDING USED, AND COMMERCIAL VALUE† OF MANURE PRODUCED.*

	Lot 1	Lot 2	Lot 3	Lot 4
Cost of feed	$ 66.46	$ 72.27	$ 72.82	$ 67 84
Cost of bedding @ $4 per ton..	1.51	1.51	1.51	1.51
Total cost of feed and bedding	67.97	73.78	74.33	69.35
†Commercial value of manure..	29.67	33.51	34.79	28.10
Difference.	38.30	40.27	39.54	41.25

†See table 11.
*Lambs were kept in pens 112 days; experiment lasted only 103 days; cost of feed as given in this table is, therefore, higher than in table 5.

Table 12 shows that the extra value of the manure from lots 2 and 3 is more than offset by the increased cost of the rations fed these lots, due to the comparatively high prices of the nitrogenous concentrates used. The market conditions which prevailed during this experiment are not permanent, however, and it is very possible that there may be times when the difference between the two rations as

regards cost would be very slight and the increased value of the manure from lambs fed nitrogenous concentrates would more than offset any slight difference in cost that might exist. The feeder who purchases commercial fertilizers can calculate from the data presented in this bulletin, together with the market prices which prevail for the feeds used, whether or not the purchase of nitrogenous concentrates will prove to be a paying proposition, so far as the fertilizing value of the manure produced is concerned.

TABLE 13—POUNDS FEED AND BEDDING USED PER TON OF MANURE PRODUCED.*

Lot	Concentrates	Roughage	Bedding	Total
1	950.1	1170.5	131.02	2251.62
2	847.3	1043.7	116.83	2007.73
3	831.1	1024.3	114.65	1970.05
4	886.6	1094.2	123.01	2103.01

*See table 10 for composition of manure.

Table 13 shows the amount of feed and bedding required by each of the lots to produce one ton of manure under the conditions of this experiment. It will be noted that the amount of feed and bedding used by each lot approximately equaled in weight the amount of manure produced.

It must be thoroughly understood in this connection that the manure under discussion was made and kept under cover, the pens having been cleaned once during the experiment and again after its close. Manure subjected to the leaching action of rains or allowed to undergo the wasting chemical action known as "fire fanging" loses much of its value and would be worth less than was the manure produced during this experiment. Furthermore, removing the manure directly from the feeding pen to the field is usually the most economical way of handling it, as well as being the most efficient in preventing losses from leaching or from "fire fanging". For further information relative to manure, its composition, and proper methods of handling it, the reader is referred to Bulletin 134 and Circular 37 of this Station.

FINANCIAL STATEMENT.

The financial statement, Table 14, covers the time from the beginning of the separate feeding of the four lots used in the experiment until the lambs were marketed at Cleveland, hence it does not correspond exactly with the figures given in Table 5 concerning the value of food consumed during the experiment. No account is taken of labor, interest on investment, insurance, manure produced, nor bedding used.

TABLE 14.

Lot 1.

Dr.

40 lambs, 2700 lbs. @ $ 6.50 per cwt	$ 175.50
97.77 bus. corn @ 48c. per bu	46.93
1.39 tons mixed clover hay @ $5.50 per ton	7.65
1.98 tons mixed alfalfa hay @ $6.00 per ton	11.88
Cost of marketing	3.40
	$ 245.36

Cr.

40 lambs, live weight at Cleveland, 3850 lbs. @ $7.25 per cwt	$ 279.13
Profit	$ 33.77

Lot 2.

Dr.

40 lambs, 2663.3 lbs. @ $6.50 per cwt	$ 173.11
81.61 bus. corn @ 48c. per bu	39.17
.4525 tons cottonseed meal @ $30.00 per ton	13.57
1.39 tons mixed clover hay @ $5.50 per ton	7.65
1.98 tons mixed alfalfa hay @ $6.00 per ton	11.88
Cost of marketing	3.38
	$ 248.76

Cr.

40 lambs, live weight at Cleveland, 3820 lbs. @ $7.25 per cwt.	$ 276.95
Profit	$ 28.19

Lot 3.

Dr.

40 lambs, 2688.3 lbs @ $6.50 per cwt	$ 174.74
81.61 bus. corn @ 48c. per bu	39.17
.4525 tons oil meal @ $31.20 per ton	14.12
1.39 tons mixed clover hay @ $5.50 per ton	7.65
1.98 mixed alfalfa hay @ $6.00 per ton	11.88
Cost of marketing	3.39
	$ 250.95

Cr.

40 lambs, live weight at Cleveland, 3830 lbs. @ $7.25 per cwt	$ 277.68
Profit	$ 26.73

Lot 4.

Dr.

40 lambs, 2680 lbs. @ $6.50 per cwt	$ 174.20
97.174 bus. corn @ 48c. per bu	46.64
34 8 lbs. stock food @ 5c. per lb	1.74
1.385 tons mixed clover hay @ $5.50 per ton	7.62
1.973 tons mixed alfalfa hay @ $6.00 per ton	11.84
Cost of marketing	3.34
	$ 245.38

Cr.

*39 lambs, live weight at Cleveland, 3780 lbs. @ $7.25 per cwt	$ 274.05
Profit	$ 28.67

*One lamb died during experiment.

A somewhat lower profit is shown from lot 4 than from lot 1 on account of the lamb from this lot having died.

Although, as we have seen in table 4, lot 1 made lower gains than did either lot 2 or 3, yet when marketed lot 1 yielded a greater profit, due to the cheaper ration fed this lot, together with a lower shrinkage from shipping.

The reader is cautioned not to regard this financial statement as applying to any conditions that are not very similar to the ones under which this experiment was conducted. Table 6, showing the amount of feed consumed per hundred pounds gain, and Table 15, showing the price at which lambs from lot 1 would have to sell *at home* in order to pay for original cost of lambs and feed consumed, at different prices of both feed and lambs, are worthy of more study and consideration than is the financial statement, which applies only to the market conditions under which this experiment was conducted.

INFLUENCE OF VARYING MARKET CONDITIONS.

While a financial statement of the feeding experiment is given in detail on page 84, it is not expected that the data there presented will be of much practical value to feeders, on account of the improbability of identical market conditions for feeder lambs and feed existing again. The financial statement of this particular experiment, then, while of interest as a matter of pure curiosity, is of little importance in a discussion of the business of feeding range lambs. A study of the data in regard to the amount of food required to produce one pound of gain, and a consideration of the existing market prices of feeder lambs and of feeds to be used should be of much practical value to feeders. Table 15, dealing only with lot 1 and calculated on the basis of the figures given in table 5 for food consumed and gains produced by this lot, is of very much more actual value to the sheep feeder than is the financial statement previously mentioned.

It should be understood at the outset that the figures presented in Table 15 are not applicable to all conditions—they are derived from the actual results obtained in this experiment from lot 1, fed a grain ration of corn alone, the roughage consisting of mixed hay made up of clover, alfalfa, and bluegrass. Although the figures on food consumed and gains produced apply strictly only to the particular instance mentioned, yet they serve a very useful purpose, since many feeders use rations which approximate the one used in this case.

The table shows, in heavy faced type, prices at which the lambs in lot 1 would have had to sell at home to pay for the original cost of the lambs and the feed consumed during the experiment, with

feeder lambs at prices ranging from $3.00 to $7.50 per hundredweight at home, and with hay and corn prices in the combinations given in the top two lines of the table.

TABLE 15—EFFECT OF VARYING VALUES OF FEEDS AND FEEDER LAMBS ON COST OF FAT LAMBS.

Assumed values of feeds								
	Hay per ton	$6.00	$9.00	$12.00	$9.00	$9.00	$6.00	$12.00
	Corn per bu.	45c	45c	45c	30c	60c	30c	60c
Assumed home price per cwt paid for feeder lambs		Price at which fat lambs must sell per hundredweight at home to pay for feeder lambs and feed used on basis of assumed price.						
$ 3.00		3.546	3.783	4.020	3.446	4.121	3.209	4.357
3.50		3.890	4.127	4.363	3.789	4.464	3.553	4.701
4.00		4.234	4.470	4.707	4.133	4.808	3.896	5.044
4.50		4.577	4.814	5.050	4.476	5.151	4.240	5.388
5.00		4.921	5.157	5.394	4.820	5.495	4.583	5.731
5.50		5.264	5.501	5.737	5.163	5 838	4.927	6.075
6.00		5.608	5.844	6.081	5.507	6.182	5 270	6.418
6.50		5.951	6.188	6.424	5.850	6.525	5.614	6.762
7 00		6.295	6.531	6.768	6.194	6.869	5 957	7.105
7.50		6.638	6 875	7.111	6 537	7 212	6 301	7.449

The following brief computation presents the method by which the table was prepared:

(Feeder lambs at $3.00 per hundredweight, hay $6.00 per ton, corn 45c per bushel).

Cost of 67.5-pound feeder lamb at $3 00 per hundredweight.....$2.02
Cost of food (155 pounds hay, 123.75 pounds corn) fed to produce 30.75 pounds gain.....**$1.46**
Cost of 98.25 pound fat lamb.....$3.48
Selling price per hundredweight necessary to pay for feeder lamb and food consumed.....$3.546
Advance per hundredweight required to prevent loss.....$.546

(Feeder lambs at $6.00 per hundredweight, hay $6.00 per ton, corn 45c per bushel).

Cost of 67.5-pound feeder lamb at $6.00 per hundredweight.....$4.05
Cost of food (155 pounds hay, 123.75 pounds corn) fed to produce 30.75 pounds gain.....**$1.46**

Cost of 98.25-pound fat lamb $5.51

Selling price per hundredweight necessary to pay for feeder lamb and food consumed..... $5.608

Decrease of value per hundredweight which could occur without causing loss ..... .392

A study of the figures in relation to the factors upon which they are based will show clearly that neither the price of feeder lambs, nor the price of feeds can control completely the profitableness of feeding operations.

The first horizontal row of heavy faced figures shows the different prices at which fat lambs bought as feeders at $3.00 per hundredweight would need to sell on account of the different prices of feeds. It is seen when feeder lambs cost $3.00 per hundredweight, hay $6.00 per ton and corn 45c per bushel, the lambs when fattened would need to sell for $3.546 per hundredweight at home. With hay at $9.00 per ton and corn at 45c per bushel, the fat lambs would need to bring $3.783 per hundredweight at home; with hay at $12.00 and corn at 45c per bushel they would need to sell for $4.02 per hundredweight and so on. It is a well known fact that the higher priced feeds necessitate a higher selling price for the finished lambs; the table shows, however, that a 33⅓ percent increase in the price of corn will necessitate a higher selling price than will a 33⅓ percent increase in the price of hay, on account of the total value of the corn fed being greater than the total value of hay fed.

The first column of figures in heavy faced type shows the home prices per hundredweight for which the lambs in lot 1 would have had to sell, with hay at $6.00 per ton, corn at 45c per bushel and feeder lambs at prices ranging from $3.00 to $7.50 per hundredweight. It will be observed that the cheap feeder lambs must sell for an advance in price per hundredweight greater than is necessary with feeder lambs at a higher price. For instance, with feeder lambs worth $3.00 per hundredweight, hay at $6.00 per ton, and corn 45c per bushel, fat lambs must sell for $3.546 per hundredweight at home in order to pay for original cost of feeder lambs and the food consumed during fattening; the home selling price necessary to "pay out" with $3.50 feeder lambs and feeds at the same price as before is $3.89 per hundredweight; with feeder lambs at $4.00 per hundredweight, $4.234 per hundredweight must be realized at home; with feeder lambs at $4.50 per hundredweight the finished lambs must bring $4.577 per hundredweight, and with feeder lambs at $5.00 per hundredweight they may be sold when fat for $4.921 per hundredweight without loss; in other words, they may be sold for less per pound when fat than they cost per pound as feeders.

From the above it will be seen that fat lambs may, under some market conditions, that is, when feeding lambs cost more per pound than it costs to produce one pound of gain, be sold for less per pound than they cost as feeder lambs; and that the higher priced the feeder lambs, the smaller the margin required or the greater the decline in price per pound that may occur without causing an actual loss, providing the cost of producing gains remains the same. In the table all instances in which the selling price per pound may, without loss, be lower than the price paid per pound for feeder lambs, are indicated by heavy lines beneath such selling prices.

SUMMARY.

The following is a summary of what seem to be the most important results of this test. All lots received the same amount of clover and alfalfa for roughage daily per lamb. Further work along this line is in progress and will be reported later.

Lot 1, fed a grain ration of corn, made lower gains in live weight than did any of the other lots. When shipped to market they shrank less in weight than did any of the other lots. This lot led in dressed percentage. Lot 1 required more pounds of food to produce a pound of gain than did any of the other lots, but produced gains at less cost per pound than did any of the other lots, save lot 4.

Lot 2, fed a grain ration of corn, 5 parts, cottonseed meal, 1 part, made higher gains than did any of the other lots, save lot 4, shrank most during shipment to market, and yielded the lowest total dressed weight and the lowest dressed percentage. The cost of gain was higher for lot 2 than for any other lot, save lot 3.

Lot 3, fed a grain ration of corn, 5 parts, linseed oilmeal, 1 part, made lower gains than did any of the other lots, save lot 1. This lot shrank more during shipment and yielded a lower dressed percentage than did any of the other lots, save lot 2. The cost per pound gain was higher with lot 3 than with any of the other lots.

Lot 4, fed a grain ration of corn and Dr. Hess' stock food, made slightly greater gains and cheaper gains than did any of the other lots. They shrank less in shipping and yielded a higher percentage of dressed weight than did any of the other lots, save lot 1. One lamb died in this lot during the experiment.

The feeding of cottonseed meal and of linseed oilmeal to lots 2 and 3, respectively, increased the value of the manure produced by these lots. The extra cost of the rations, however, more than equaled the increased value of the manure.

Lots 3, 2, and 4, in the order mentioned, refused less roughage than did lot 1, indicating that the feeding of nitrogenous concentrates or of Dr. Hess' stock food has a tendency to increase the consumption of roughage.